REMARKS

Claims 1 - 13 are pending with claims 1, 2, and 8 amended by this response.

With regard to paragraph 3 of the "Detailed Action" Applicants have elected not to have the IPER for PCT/US/01/0863 separately listed as reference via a PTO-1449 (or an SB/08A) since the IPER does not predate the filing of this application and cannot constitute prior art thereto; in a similar manner, the text of the Australian Office action, presented on the previous page, need not be listed but must nonetheless be reviewed/considered by the examiner.

The specification has been amended on page 28 to address the informality noted by the examiner, it is believed the sentence grammar is adequate.

Dependent claims 2 and 8 have been corrected above.

The present invention relates to the use of simulated annealing techniques applicable to the solution of the 4-D time lapse gradiometer problem to find the gas/oil reservoir boundary to enhance oil recovery schemes using steam injection or the functional equivalent; 3D simulated annealing to determine the location of salt roots is disclosed in the primary reference to Nagihara including the use of block-like volume elements (see Nagihara, page 1, starting at the last paragraph on the right-hand column).

Claim 1 has been amended to change the originally presented "obtaining" to now read "measuring"; it is nonetheless submitted that claims 1-7 as originally presented define 35 U.S.C. §101 subject matter. The claims define a method for the determination of changes occurring in a sub-surface natural resource reservoir (claim 1) or a sub-surface oil reservoir (claim 7). The claims are related to a "useful, concrete and tangible result" under *State Street Bank & Trust Co. v. Signature Fin. Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998), not an abstract data structure like the rejected claims *In re Warmerdam*, 33 F.3d 1354 (Fed. Cir. 1994) and are entirely consistent with the method claims allowed in *Arrythmia Research Technology Inc. v. Corazonix Corp.*, 958 F.2d 1053 (Fed. Cir. 1992) and the much earlier *In re Johnson*, 589 F.2d 1070 (CCPA 1978).

In the Office action, the original claims were rejected under 35 U.S.C. §103 as unpatentable in view of Nagihara and Lumley in further view of the IGC publication; the examiner contended, in part, that Nagihara taught at least some of the limitations of independent claims 1 and 7 but for the time-lapse gravity gradient data and that Lumley taught the 4-D aspect.

The 35 U.S.C. §103 rejection is respectfully traverse; applicants contend that the references do not disclose, teach, or suggest the claimed combination. Applicants' position

is based, in part, on an apparent mis-reading of the variable U appearing in the Lumley paper (as discussed below).

The primary reference to Nagihara teaches gravity-based simulated annealing in the location of the root structures of salt canopies/domes as an improvement over the use of seismic imaging. Salt dome formations are often associated with the accumulation of fluid/gaseous hydrocarbon deposits and are considered 'static' geologic formations in which density does not change in the short term. Thus, any Nagihara model would not normally include or encompass density change in the salt deposit or a time-lapse component.

Lumley is directed time-lapse seismic monitoring consequent to repeated seismic surveys; Lumley is not directed to gravity gradients and changes thereof. In the Office action, paragraph 24, the Examiner noted the variable "U" in equation (28) and characterized that variable as the gravity potential field; the variable "U" as presented in equation (28) of Lumley relates to the seismic "upgoing wavefield" and not gravity (see the first part of the paragraph preceding equation (28) on page 8 of Lumley). While the variable "U" is used to characterized gravity in the literature, Lumley is using "U" in a seismic context, not a gravity context. Lumley teaches nothing about gravity and is basically unrelated to the present invention.

The IGC paper is of interest in discussing gravity gradiometry/gravimetry in general, the IGC silent as to 4D gravity gradient measurements.

Applicants submit that the Lumley seismic reference does not instruct or otherwise indicate modification of Nagihara toward the 4D use of gradients in relation to short-term changes in density. Applicants submit that a person of ordinary skill in the art would have no reason to modify the Nagihara disclosure relating to a static salt dome assessment in view of the seismic teachings of Lumley. One of the attributes of obviousness is a reasonable expectation of success of any purported combination; in the present situation, the prior art, even if combined as suggested by the Examiner, does not yield a reasonable expectation of success.

The Schweitzer et al. patent, cited above, claims a process for initially calibrating an accelerometer type gravity gradiometer used to assess changes in a oil/gas reservoir undergoing secondary recovery using a driveout fluid. As shown in the first functional block of FIG. 10B, time-lapse gradients differences between data set(m) and (m+1) are disclosed. It is noted that Schweitzer et al. is, at best, related to the measuring step defined in both claims 1 and 7; however, Schweitzer is silent as to any other aspects of the claimed method steps. Additionally, the disclosures of Nagihara, Lumley, and the IGC paper do not suggest modification of Schweitzer or combination therewith in the direction of the present invention

with the requisite reasonable expectation of success.

In view of the above, it is respectfully submitted that the application is in condition for allowance; an early formal indication thereof is respectfully requested.

Date: February 14, 2005

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Atty Docket: FE-493-US